

The University of Chicago

THE EVOLUTION OF LAND UTILIZATION IN LEBANON, NEW HAMPSHIRE

A PART OF A DISSERTATION SUBMITTED TO THE FACULTY OF THE
DIVISION OF THE PHYSICAL SCIENCES IN CANDIDACY FOR THE
DEGREE OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF GEOGRAPHY

1931

BY

EDWARD N. TORBERT

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Reprinted from
THE GEOGRAPHICAL REVIEW

Vol. XXV, No. 2, APRIL, 1935

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Edward N. Torbert

[With separate map, Pl. III, facing p. 230]

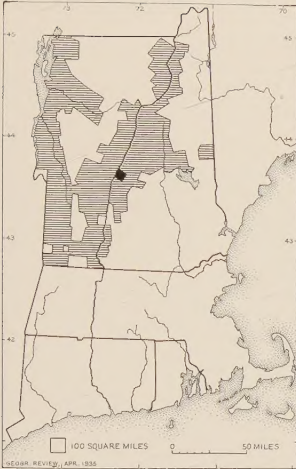


FIG. 1—Land grants made by Governor Wentworth of New Hampshire, 1760–1764 (shaded), including the town of Lebanon (solid black).

The town of Lebanon, New Hampshire, presents typical features of the northern New England landscape—the thriving dairy lands and pine-clad old fields, the gaping cellar holes of abandoned hill farms and the populous industrial center in the valley below. In the contrasting features of this one town may be traced the general evolution of land use in New England. In particular Lebanon affords opportunity for study of the shift from farm to factory, contrasting markedly in this respect with the near-by town of Lyme, whose story is graphically recounted as “A Town That Has Gone Downhill.”¹

EARLY SETTLEMENT

The first mark of permanent settlement in Lebanon was a log cabin built during the fall of 1762 on a wooded flat of the Connecticut River. The builders were among the first of hundreds who came from eastern Connecticut to Lebanon and other wilderness towns of the upper middle Connecticut Valley. Need for new land brought many; for in that long-settled part of Connecticut from which they came farms had early been subdivided into holdings that yielded a bare subsistence. Migration before 1760 had been discouraged by the menace of Indian attack; but at the close of the French and Indian War many young people, in quest of those promising valley lands reported by farmer militiamen, pressed northwards along the Connecticut River corridor.

Migration was quickened by attractive offers from speculative proprietors of new towns. These towns—wilderness tracts of about thirty-six square miles each—were granted in such rapid succession by Governor Wentworth of New Hampshire that in the five years 1760–1764 a vast area (see Fig. 1) was thrown open for settlement. Under the spur of keen competition the proprietors of each new town offered the prospective settler many inducements. Among other

¹ By J. W. Goldthwait, *Geogr. Rev.*, Vol. 17, 1927, pp. 527–552.

things, the 62 proprietors of Lebanon had a "horse road" cleared from the uppermost valley settlement to Lebanon, 30 miles beyond, donated money and lands for the erection of a sawmill and a gristmill, and subscribed funds "for the encouraging of the preaching of the Gospel."

The efforts of the Lebanon proprietors proved successful. The pioneers of 1762 were joined in the following year by four families,



FIG. 2.—Upland hay field. Early settlers moved only the medium-sized boulders: the small stones, it was believed, would add to the fertility of the soil and larger boulders were left undisturbed.

and during each of the next nine years about five families came to Lebanon. This steady inflow of settlers, which apparently continued until about 1790, was augmented by natural increase in the large families characteristic of the period, so that by 1790 the population of the town reached 1180.

A large number of the early comers pitched upon lands near the mouth of the Mascoma River (Pl. III).² Here, on relatively extensive intervalles and terraces, they found lands that could be quickly subdued—flatish, stone-free areas with a friable soil and good drainage. As they were closely grouped and on the main track from the south, these settlers were saved the worst hardships of isolation. In addition, the clearings were handy to the first gristmill and the first sawmill, both of which were erected at power sites on the lower Mascoma.

Clearings were early established in the boulder-strewn uplands, however, on soils of superior fertility (Fig. 2). The agricultural

² Lists of persons known to have been in the town in 1767 and 1776, the recorded locations of some early settlements, and early road surveys were the principal materials used in compiling the maps. Surveys of most of the roads laid out in the town are recorded in the *Town Records* of Lebanon. The date, the starting point, compass directions, distances in rods, and the end are given for each survey. Hence it has been possible to plot and locate most of the more than 190 surveys made before the first published map of the town (1855). The brief description preceding each survey and the bounds contained in it, when correlated with published descriptions and a field investigation of the old roads and farm sites, have made it possible to plot most of the early settlements.

worth of soils selected by upland farmers was gauged by the vegetation. Nine classes of soils were thus commonly recognized, but that which was "generally esteemed the most easy and advantageous for cultivation" was the "warm, rich loamy soil" that supported beech and maple trees.³ This superiority of beech and maple land helps to explain the early preference for the southern upland, for in this district beeches clearly predominated (Fig. 4).

A SUBSISTENCE FARM ECONOMY

Cleared lands won from the forest were quickly put to those uses that best promised the settlers a subsistence; isolation left no alternative. So marked was the subsistence level of early farming that supplies occasionally needed just north of Lebanon in the Dartmouth College community could not be obtained in the vicinity. In December, 1770, President Wheelock hesitated to enroll a newly arrived student, explaining to the latter's father that "... the great difficulty in taking your son at present is ye want of provisions in this starved country."⁴ In the summer of 1774 a search "all around the Country [near Hanover] for Butter" proved futile, and during previous years wheat, flour, and butter were carried to the college from older settlements fifty, a hundred and more miles down the Connecticut.⁵

The cultural features of the changing landscape reflected subsistence farming. The average amount of land cleared for agricultural use on the 118 farms of twenty or more acres in 1789 was only fifteen



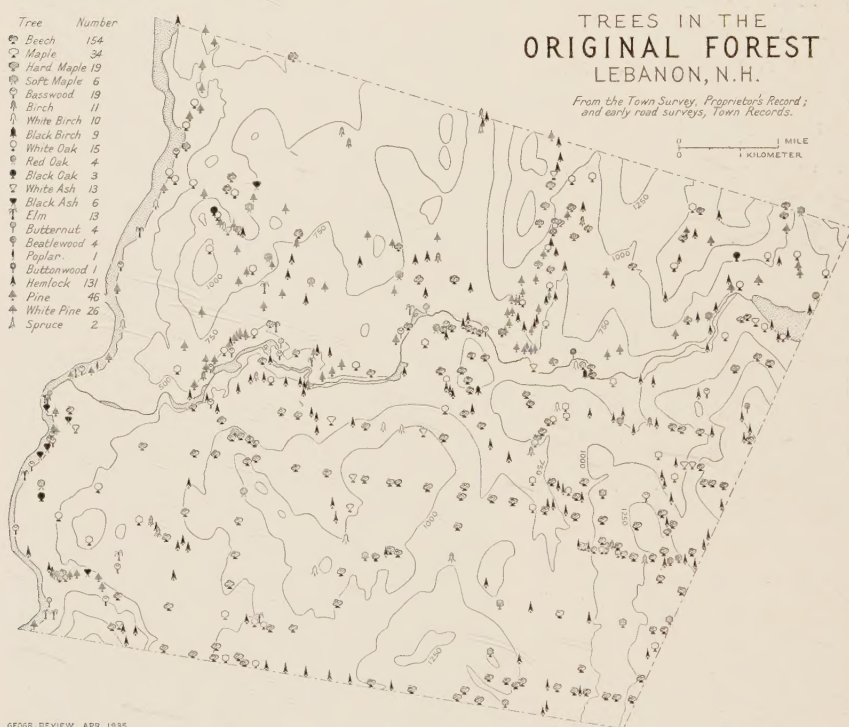
FIG. 3—Beech-maple-hemlock woods in southeastern Lebanon. A climax forest of the type found by pioneers in Lebanon (compare Fig. 4).

³ Jeremy Belknap: *The History of New-Hampshire*, Vol. 3, Boston, 1792, pp. 128-130.

⁴ Wheelock Collection, MS 770653.4, Dartmouth College Library, Hanover, N. H.

⁵ *Ibid.*, MSS 773658, 773665, 774119.1, and 77406.3.

and one-half acres. Within the following eleven years the cleared land per farm was nearly doubled (Fig. 5). The growth of population during these years was so rapid, however, that the amount of cropped land per person actually decreased and the acreage of mowing land and pasture land per person increased very little.⁶ In addition to



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FIG. 4—A reconstruction of the original forest cover of Lebanon, from 531 trees named as bounds in the early surveys.

these improved lands, there evidently were even larger areas, used as pasturage for sheep and young cattle, from which much or all of the timber had been cut or burned.

Details of the landscape revealed the manner in which settlers

⁶ The statistical materials that appear in the foregoing discussion and that were used in the construction of Figure 5 and other figures to be presented later were obtained from the *Invoice Records* in the Town Hall, Lebanon, N. H. The taxable estate of each person on April 1 was entered yearly in the *Invoice*. From the *Invoice* of 1787, the earliest one found, to that of 1833 the entries were very detailed, the items of interest to this study being polls; acreages in orchard, plowing, mowing, pasturing, and wild land; and the numbers of horses, oxen, and other cattle of various ages. Less complete entries in 1833 and later years have made it impossible to compute the total amounts of land in the various uses after that date.

The acreages of land in the different classes of utilization cannot be accepted as precise measurements; for the acreage estimates entered in the *Invoice* are in terms of productivity rather than in terms of areal extent. A tax act of June 12, 1784, defined an acre of orchard, for example, as so much "as will produce ten Barrels of Cyder or Perry, one year with another," and an acre of mowing as so much "as will produce one year with another one tun of english Hay or other Hay equivalent" (H. H. Metcalf, edit.: *Laws of New Hampshire*, Vol. 5, Concord, 1916, pp. 9-10).

were adjusting the farming practices of eastern Connecticut to their new forested holdings. The immediate needs of the Lebanon farmer were grain for his family and grass for his stock. A common way of meeting these needs was to sow a mixture of grass seed and winter wheat or rye on newly cutover lands. In the year following the grain

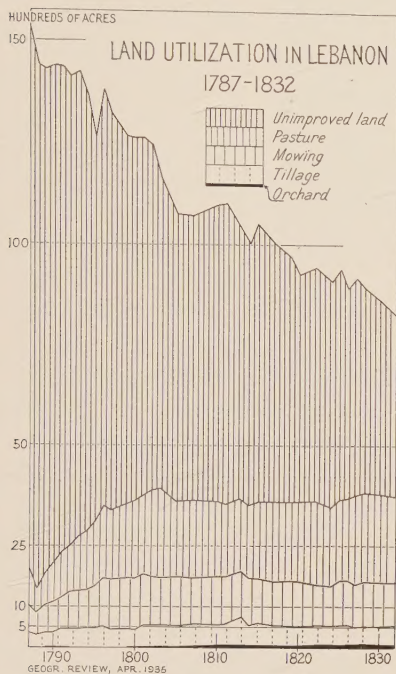


FIG. 5

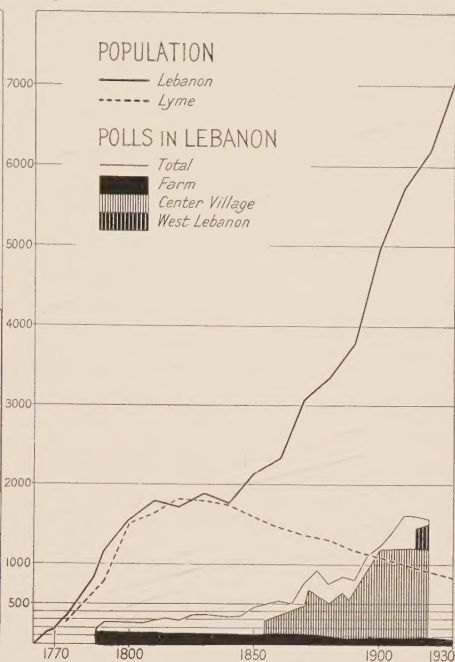


FIG. 6

FIG. 5—Graph showing the progress of land utilization in Lebanon from 1787 to 1832.

FIG. 6—Graph showing population and polls in Lebanon. The continued increase of population in Lebanon after 1840 is due to urban growth: the graph for Lyme, a neighboring town that remained rural, is added for comparison. This urban development is also indicated in the polls for the Center Village and West Lebanon precincts, as contrasted with the farm polls.

harvest the grass seed brought the land into hay or pasturage. Strict observance of this procedure meant that the tilled land of one year was being added to the mowed and pastured area of the following year. There came a stage in the development of each farm, however, when more grassland was not essential and when particularly suitable fields were tilled year after year. For the town as a whole that stage appears to have been reached about 1803 (Fig. 5). As fields were singled out for repeated cultivation a greater variety of crops undoubtedly appeared; for corn and barley gave heavier yields on old lands than on new, and it was said that flax, oats, and peas could not be raised "with any advantage" until the land had been cultivated "for some years."⁷

⁷ Belknap, *op. cit.*, p. 136.



FIG. 7—The home of an early settler in Lebanon. The house was built on a terrace near the mouth of the Mascoma River before 1780.

By 1800 the pioneer stage was drawing to a close. Fenced-off tilled lands and mowings, pastured lands, farmsteads, and roads occupied conspicuous portions of the landscape. They by no means dominated it, however, for about four-fifths of the town bore a wood-

land cover of one sort or another. Frame houses and barns very probably had supplanted log buildings on all but the small and lately established clearings (Figs. 7 and 8). At five or more houses, scattered through the town, such articles as salt, sugar, molasses, tea, coffee, chocolate, and perhaps a few items of hardware were retailed. On the chief thoroughfares nine tavern keepers accommodated travelers. Three gristmills had been erected at power sites along the Mascoma, and there was a fourth on Sawmill Brook in the southwestern part of the town. Sawmills were in operation at the same sites or at others close by. At "several tanneries in different parts of the town" leather was produced for local use or for shipment down the Connecticut. The first school had been built in 1768; by 1775 settlement had spread enough to warrant the establishment of four school districts, and in 1784 the number of districts was doubled.

The road net of 1800 shows the first instance of the tendency for transportation to slip from hill to valley routes—a trend that even today is not ended. The way was now prepared for the growth of villages. The settlement of new areas and the construction of more and somewhat improved roads were making for the concentration of mills, stores, and other services at two strategic sites on the Mascoma. In 1800 the more important was Payne's Mills at the outlet of Mascoma Lake. The second village was taking form near the center of the town on a small plain that had become a focal site for all Lebanon in 1792 when the new Town Meeting House was erected there. Its continued growth has been a conspicuous feature of the town.

DIVERSIFIED COMMERCIAL AGRICULTURE ON A SMALL SCALE

The first three decades of the nineteenth century saw a transition from subsistence farming to commercial agriculture. Shipments to

temporarily enlarged markets overseas were facilitated by improvements permitting the unobstructed navigation of the Connecticut from Lebanon to the port of Hartford in 1802. Boat traffic, however, reached its peak about 1804 and declined steadily thereafter; the growing commerce was largely diverted



FIG. 8—"Aaron Hibbard's new house," 1797. All early houses apparently stood in the open sun. The hackmatack trees before this house were not planted until about the middle of the nineteenth century, for they appear as mere saplings in an engraving of the house on a map of 1855.

ed over new and better land routes to new markets in the rapidly expanding industrial towns of southeastern New England.

Earlier there had been almost no traffic across the rough upland lying between the Connecticut and Merrimack valleys. The Governor's Road had been completed in 1772, but this roundabout, hilly route proved of little use for sleigh or cart traffic. Two proposals made later for the improvement of a wilderness track that crossed the low divide between the Mascoma and Smith rivers seem never to have progressed much beyond route surveys. Residents of Lebanon and Hanover had urged the improvement without success; but with the turn of the century they assured themselves of a market road by organizing the Fourth New Hampshire Turnpike Corporation. Nearly all the 400 shares of stock were purchased by people in Lebanon, Hanover, and Portsmouth.⁸ With the locally obtained capital a good roadbed was constructed over the shortest proposed route between Lebanon and the middle Merrimack Valley. The completion of other turnpikes in New Hampshire and Vermont made Lebanon an important crossroads town, and the way was paved for further commercial and industrial development, as well as for agricultural advance.

Commercial agriculture was inaugurated by the production and shipment of a variety of farm products. Among the more important were flaxseed, linseed oil, pork and lard, salt beef, and wheat. The amount of wheat grown decreased, however, until, before 1840, it was not enough for home demands. Each autumn after 1800 from 200 to 500 fat cattle were driven from Lebanon, most of them to

⁸ J. M. Shirley: The Fourth New Hampshire Turnpike, *Granite Monthly*, Vol. 4, 1880-1881, p. 229; J. W. Goldthwait: Six Old New Hampshire Turnpikes, *New Hampshire Highways*, Vol. 10, 1932, pp. 1-7 and 12-19.

Boston. The opening of good roads particularly stimulated shipment of butter and cheese. Between 1790 and 1810, although local demands for dairy products remained comparatively uniform, dairy herds were more than doubled in size. To convey these goods to market there developed those annual pilgrimages in farm sleighs that

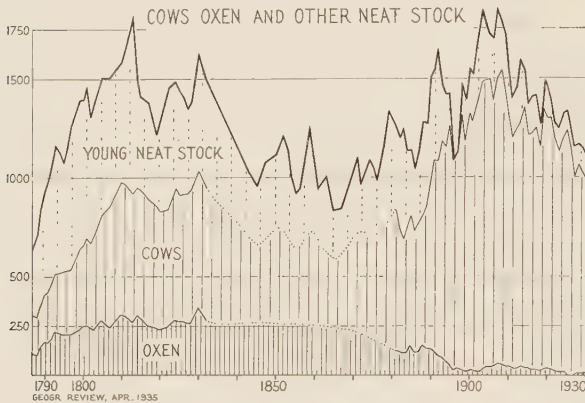


FIG. 9—Graph illustrating phases of cattle raising in Lebanon.

seem to have been welcomed by farmers as a holiday and social event, quite apart from any extra profit involved. When the traveling was good, box sleighs, drawn by a span of horses and laden with butter, cheese, pork, and poultry, were said to have "almost filled" the

Fourth New Hampshire Turnpike and connecting roads from Montpelier to Boston.

Larger shipments of animals and animal products were made possible, not by proportional extension of pastures, mowings, and grainfields, but by more intensive use of lands already improved. This took form in an accelerated turnover of livestock and in improvements in farm lands and practices. By adopting the policy of selling beef animals when less than two years old, instead of retaining them for another year or more, farmers after 1810 reared more cows and calves without increasing the total number of stock. Improvements in the land itself and in agricultural practices increased the productivity per acre. The removal of stumps and boulders increased the tillable area and provided materials for enclosing the fields. Where there were many boulders, the tendency was to wall in small fields long and narrow in shape. The small field was advocated as a means to increased production per acre:⁹ by the shape effort was saved in removing the boulders. Careful use of manure, thorough plowing, and a judicious rotation of crops were urged through books, papers, and local societies concerned with farm management, and the stimulus of profitable markets may have hastened somewhat the slow adoption of these practices.

For the first time differences in the agricultural quality of lands became of crucial importance. Rather than remain on subsistence

⁹ Samuel Deane: *The New-England Farmer*; or, *Georgical Dictionary*, Worcester, Mass., 1790, pp. 70, 205, and 206.

farms that could not be made to support a family on newer and higher standards, some farmers sold out and moved on, either to sparsely settled sections of northern New England or to the West. Neighboring farmers and a few people of wealth who were attracted to Lebanon purchased such farms and consolidated them with other holdings to make larger, more valuable units. Although a few large farms were divided among sons of the original settler, the process of consolidation was more general than that of division, and after 1800 the number of farms of 20 or more acres declined from the maximum of 132.

The concentration of commercial, social, and manufacturing activities became more marked. An extension of manufacturing



FIG. 10—Graph illustrating the rise and decline of sheep rearing in Lebanon.

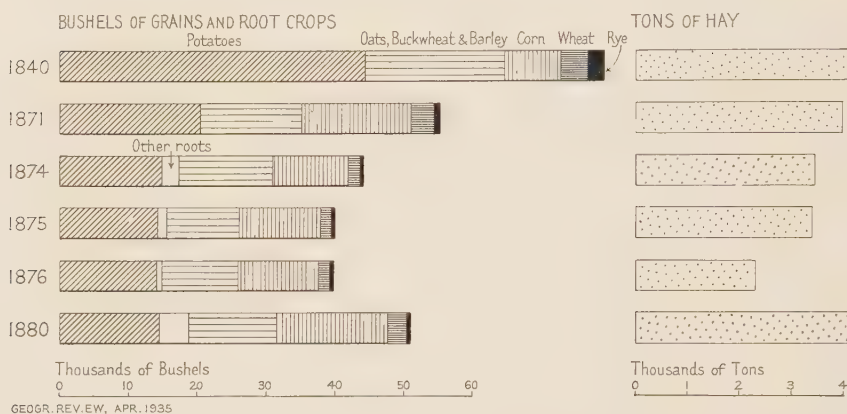
at Payne's Mills appears to have made that settlement the more important one until about 1840 and to have earned for it the name Lebanon City. A small cotton textile mill was being operated there as early as 1821, and about 1830 a larger mill was established in which about thirty people were employed in the manufacture of cotton and woolen textiles. Associated more closely with the farm community tributary to the "City" were the gristmill, the sawmill, the wool-carding and cloth-dressing establishment, the shop of a wheelwright and cabinet maker, and the blacksmith shop.

Although secondary to the "City" in manufacturing, Lebanon Plain rose to commercial and social leadership of the town. In addition to mills, stores, a meetinghouse, and two schools, the community boasted a Masonic Hall and a "social library" containing more than three hundred volumes. A hatter and a saddler brought the number of residents following a craft or a profession to a total of eleven. Two large taverns reflected the wider commercial importance that the village enjoyed as a turnpike crossing; so, too, did the pattern of the growing settlement, for the village clung to those axes that brought it life.

COMMERCIAL WOOL FARMING

A revolutionary change in agriculture took place in 1830—the expansion of commercial wool growing. The venture into sheep rearing on a large scale was precipitated by the heavy demands for

wool that arose as domestic woolen manufacturers increased their output under protection of the tariff of 1828. Stimulated by the high prices, farmers in Lebanon doubled and redoubled their flocks between 1830 and 1840, adding more than 13,000 animals to the number of sheep within the town. The premium on fine grades encouraged farmers to improve the quality of wool by crossing their "common



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FIG. 11.—Graph of the crop production of Lebanon, 1840 to 1880. Data for 1840 is from the U. S. Census, for succeeding years from the annual reports of the New Hampshire Board of Agriculture.

sheep" with the few Spanish and Saxony Merinos that had been brought to Lebanon during the earlier, but locally unimportant, Merino "craze" of 1807–1816.

The new sheep industry seriously taxed the agricultural resources of the town; for evidently until farmers felt reasonably sure that sheep rearing had a promising future they made no proportional reduction in the numbers of other stock. As early as 1832 the demands upon lands producing grain and forage crops were fully 60 per cent greater than they had been, on the average, during the period from 1800 to 1830. The production of more stock feed was imperative. By 1840 as much as 90 per cent of the cultivated land had probably been turned to the production of crops for the support of stock; hay alone occupied 70 per cent of the cultivated area. Considerable amounts of buckwheat were then being grown, since this plant yielded stock feed on "weedy and waste lands" and at the same time prepared these lands for more valuable crops. The cultivated area was increased by this means and also by elimination of the summer fallow; but in the absence of adequate schemes of rotation soil fertility declined. This, in turn, led to belated improvements.¹⁰

Great as was the demand upon cropped land, more was exacted from pasture land. Estimates of that time seem to indicate that the

¹⁰ In 1852 it was reported from Rutland, Vt., that "many now plough deep and give thorough culture, and begin to understand that the greatest support upon which they can depend is their manure" (*Ann. Rept. U. S. Patent Office, 1852, Washington, 1853, Part 2, p. 134*).

addition of every sheep placed nearly twice the demands upon pasturage as upon tilled lands. Furthermore, lambs required summer pasturage but not winter forage, since they were dropped in the spring and disposed of in the autumn.¹¹ Pasture requirements probably were increased more than 200 per cent above the earlier level, and this upset the apparently nice balance between numbers of stock and pasture capacity that had been maintained from 1800 to 1830. Although at first the intensive grazing doubtless seemed beneficial to bushy pastures, continued overstocking reduced the quantity of forage grasses and lowered their quality. A farmer in Hanover estimated in 1855 that "in the best season . . . not more than three quarters as much stock can be supported at pasture as ten years ago."¹²

The boom period of sheep rearing came to a close about 1845, and two readjustments in the industry followed. The first was marked by a very abrupt decline in the number of sheep and by a compensating rise in the weight of fleeces.¹³ The change was a matter of necessity; for farm lands were less productive, the estimated costs of maintaining a sheep had increased more than 30 per cent,¹⁴ and wool prices were lower. This first readjustment appears to have been completed in about ten years, and, aided by slightly higher prices, the wool industry entered upon a period of stabilization in 1855. Stabilization was terminated by a revival during the Civil War, when exceptionally high prices for coarse wools again made sheep rearing profitable on all farms.

The landscape gained a decidedly pastoral aspect during this era of wool growing. By 1855 the area of woodland had been reduced to less than one-fifth of the town. The land in crops, three-quarters of which was given to fields of timothy and clover, was slightly greater than the wooded area. The continued extension of pasture land at the expense of woodland was attended by an interesting change in outlook toward trees. A shade-tree movement that resulted in the planting of sugar maples, elms, locusts, and hackmatacks along roadways and in farmyards gained considerable headway by 1860. In the annual town meeting of 1861 it was resolved "that the inhabitants of the town be allowed to set out shade trees and make sidewalks on the sides of the streets,"¹⁵ and by 1871 there were at least two nursery-

¹¹ These lambs were not taxed and so did not appear in the *Invoice*. Consequently the pastures of Lebanon in reality were supporting between 50 and 100 per cent more sheep than are recorded in Figure 10.

¹² *Trans. New Hampshire State Agric. Soc.*, 1855, Concord, 1856, p. 282.

¹³ The average weight of Merino fleeces in New Hampshire increased from two pounds six ounces in 1840 to four pounds in 1856 (E. A. Carman, H. A. Heath, and John Minto: *Special Report on the History and Present Condition of the Sheep Industry of the United States*, U. S. Bureau of Animal Industry, Washington, 1892, p. 331).

¹⁴ *Ann. Rept. U. S. Patent Office*, 1849, Part 2, pp. 86 and 242; 1850, Part 2, p. 335; 1852, Part 2, p. 146; and "Is Wool Growing Profitable at the North," *Granite State Whig*, Lebanon, N. H., Apr. 29, 1859.

¹⁵ C. A. Downs: *History of Lebanon, N. H., 1761-1887*, Concord, N. H., 1908, p. 294.

men in the town. With great effort the pioneer had chopped his sunny homesite from a hostile forest, but in 1855 a farmer in Hanover "feared" that another season would "see the axe in more active operation." The ax was no longer the symbol of liberation: trees had become valuable assets.

URBAN GROWTH AND RURAL DECLINE

A marked shift in population, characteristic of New England as a whole, was under way in Lebanon by 1850. A rapid growth of urban population and a slow decline in rural population had set in.

The sudden and sustained increase in the population of the town after 1840 was due solely to an expansion of urban centers (Fig. 6); for the trend in rural population was downward, like that in neighboring towns in which no large villages grew up.¹⁶ The data for Lyme, for example, show the trend in a town similar in agricultural resources but lacking the conditions that made for urban development in Lebanon.

The decline in rural population was reflected in abandoned farmsteads, most of them in areas of steep slopes and thin soils, where crop production had become unprofitable. By 1860 there appear to have been at least thirty fewer farmhouses or house sites occupied than there had been about 1830, and by 1892 the number in disuse had risen to fifty-two (Pl. III). These losses, however, do not represent the abandonment of a proportional amount of improved land. In most cases deserted lands seem to have been added to the hay lands and pastures of farmers who remained. Consequently, after the sheep industry passed the peak of 1845 there probably began an abandonment of houses and an enlargement of landholdings somewhat like that which had occurred in the early part of the century. There seems, however, to have been this difference: the earlier enlargement of holdings resulted, in large part, from the aggressive action of optimistic purchasers, whereas the later one was merely incidental to the abandonment of farms by discouraged owners.

This downward trend in rural population was accompanied by a rapid growth of villages. An era of urban expansion was opened in 1848 by the completion of the Northern Railroad between Concord, N. H., and Lebanon. Regular employment at the terminus of the road in western Lebanon and at the railroad junction just across the Connecticut furthered village growth (Pl. III), but of far greater importance was the establishment of new manufacturing enterprises. Before the construction of the railroad costly transportation had

¹⁶ See the series of maps of "Population Trends by Townships in New Hampshire & Vermont, 1790-1930" accompanying H. F. Wilson: *Population Trends in Northwestern New England, 1790-1930*, *Geogr. Rev.*, Vol. 24, 1934, pp. 272-277. See also the same: *Population Trends in North-Western New England, 1790-1930*, *New England Quarterly*, Vol. 7, 1934, pp. 276-306.



FIG. 12—Maps illustrating two stages in the development of Lebanon's chief center. On the map for 1860, roads, streets, and buildings are from H. E. Walling's "Topographical Map of Grafton County," 1860. Contour interval on the map for 1860 is 200 feet; on the map for 1930 the 700-foot contour only is shown. Maps of Lebanon Village for 1826 and 1892 have also been prepared and similar maps for West Lebanon-White River Junction in 1855 and 1930.

hampered the development of manufacturing and doubtless had contributed to the failure of the early textile industries in Lebanon, all of which had been abandoned by 1841. In 1844 carriage by farm sleigh from Lebanon to the northern terminus of the railroad at Concord cost \$10.00 a ton.¹⁷ Four years later the Northern Railroad advertised rates from Lebanon to Boston—more than twice the distance to Concord—of \$5.80 a ton for first-class freight and \$4.80 for second-class freight.¹⁸

Most of the new industries were established at the village near the center of the town. It acquired a new name, Lebanon Center, after the new village of West Lebanon was founded at the terminus of the railroad. The Center, indeed, had gained the leadership in 1840 when a fire destroyed all the mills at the eastern village, Lebanon City, whose pretentious title fell into disuse and was replaced by East Lebanon.

The expansion at Lebanon Center was based on superior water-power resources together with availability of railroad transportation. The operation of gristmills, sawmills, and other small-scale manufacturing plants had required little power, had not been greatly hampered by shutdowns, and had proved successful in Lebanon and elsewhere at sites where only small and fluctuating amounts of power could be obtained. Power in considerable amounts and of dependable character was, however, prerequisite to the establishment of larger factories, and power of this description was available from the Mascoma at Lebanon Center. The river has a comparatively uniform flow because of the storage afforded by the many lakes and marshes in the large, flattish basin behind Moose and Shaker mountains. The location was much more satisfactory for industrial development than the earlier manufacturing village in eastern Lebanon. At and below the latter, power sites are strung along the narrow, steep-walled gorge, where there is little or no available land for village growth, whereas at the Center good, closely spaced power sites are adjacent to large areas of flattish or moderately sloping lands.

At this favored center three overlapping stages of industrial development may be recognized after 1848. The first was dominated by industries using iron, the second by wood-using industries, and the third by textile manufacture.

The industries first established at the Center turned out a remarkable variety of products, the more important of which required considerable quantities of iron. Capitalists at first seem to have anticipated the profitable production in the village of many, if indeed not all, of the manufactured articles needed in the tributary country-

¹⁷ Professor C. B. Haddock of Dartmouth College gave the rate as fifty cents per hundred in his "Address Before the Railroad Convention at Montpelier, Vermont, 1844" (in his "Addresses and Miscellaneous Writings," Cambridge, Mass., 1846, p. 109).

¹⁸ *Granite State Whig*, July 7, 1848.

side. One plant, the pride of the village in 1855, was producing mill irons, portable and stationary steam engines, planing and mortising machines, mowing machines, sewing machines, brick machines, nail machines, nails, shoe pegs, and other articles.

Remote from sources of iron and from coal with which to work it, Lebanon was poorly situated for continuance of the several industries requiring large quantities of these materials, and marked readjustments took place. The first change was toward specialization in fewer articles. At one machine shop in 1873 attention was centered on the production of woodworking machinery, at another on water wheels and circular sawmills; and at the Granite Agricultural Works 550 mowing machines were manufactured annually. Furniture, patented drag rakes, organs, and patented dustproof watch keys were new specialties established before 1877. This trend was followed by the elimination of all heavier metal industries except the foundries and machine shops essential to a factory center. By 1887 the only important metal-using industries were the rake factory, the watch-key shop, a foundry, and two machine shops, and not long after that one machine shop and the rake factory ceased operations.

Despite the rise and fall of ill-adjusted industries, activity at the Center seems to have advanced to successively higher levels. The village continued to grow and to show a more marked orientation to the mill section. As attractions for industry there were added to the excellent power resources a growing supply of labor and a policy of exempting new capital investments in industry from town taxation for a period of ten years. The industrial vitality of the site was amply demonstrated after the fire of 1887, which destroyed all the mills in the central section, laying waste 80 buildings on an area variously estimated to be from eight to twelve acres in extent and throwing 600 men out of employment. Recovery was so speedy that neither the population record (Fig. 6) nor the map of 1892 (not included here) gives any indication of the catastrophe.

The roster of industries after the fire, however, showed marked changes. The furniture business had incurred heavy losses for a number of years, partly because of inability to market profitably a greatly increased output, into much of which went black walnut, chestnut, and other woods not available in the vicinity. The leading position passed to a new group of industries. A start on this line of development had been made shortly before the fire with the establishment of two woolen mills and two garment factories. These four enterprises employed about 250 people in 1886. Only one of the mills had been destroyed by the fire. This had been promptly rebuilt, and to the group of four a knitting mill and another woolen mill were added. The growth of this group of industries seems to have been forwarded by labor advantages as well as by adequate power. At the time the

new mills were erected the women of the community constituted a large and unexploited supply of labor. The textile-mill owners also found of advantage the soft water from the crystalline rock basin of the Mascoma. This is admirably suited, without treatment, for bleaching and dyeing processes. Furthermore, the power advantages were increased; for the addition of controlled storage capacity behind dams upstream—a capacity that today has been enlarged to 1354 million cubic feet—permitted regulation of the flow.

AGRICULTURAL READJUSTMENTS

In agriculture, two changes occurred between 1867 and 1910. The great sheep-raising period was followed by twenty years of experimentation, of fumbling for a new and more profitable branch of agriculture. Cattle rearing, wool growing, a combination of the two, the rearing of horses, grain farming, fruit culture—each had its advocate in 1871.¹⁹ The general trend was from sheep to cattle; but the changes were not sudden except for the marked decline in sheep rearing that took place when the unusually high prices for wool that had prevailed during the Civil War dropped to prewar levels. This sudden slump in sheep rearing was followed by more than a decade of relative stability; for a large number of Lebanon farmers, in the absence of an alternative proved more profitable, clung to the production of thoroughbred Merinos.

Many of the farmers who sought in cattle rearing a more profitable activity than wool growing turned their attention to dual-purpose animals. Durham bulls were introduced, and considerable progress seems to have been made in the production of superior beef animals without great sacrifice of dairy qualities. The farmer now found increasingly greater demands for beef and for dairy products in the growing villages, in addition to markets in southeastern New England. Beef production increased from 58,000 pounds in 1874 to 79,500 pounds in 1880; the annual production of butter was about 35,000 pounds.

The period of experimentation terminated in the establishment of two creameries, one at Lebanon Center in 1886 and the other at West Lebanon before 1888. Sheepmen speedily disposed of their flocks; dual-purpose animals went out of vogue and Jerseys became favorites as the efforts of most farmers were turned to the production of butterfat now in demand at the new creameries. In the evident readiness of sheep owners to abandon wool growing when this promising alternative arose is the recognition of their inability to compete with the wool industry that had been growing by leaps and bounds in the West, where the cost of wintering animals was lower.²⁰ Further-

¹⁹ *First Ann. Rept. New Hampshire Board of Agriculture*, 1871, p. 98.

²⁰ In 1873 nearly three-fourths of the annual cost of maintaining a sheep in Lebanon were assigned to winter forage in an itemized estimate presented to the Lebanon Agricultural and Mechanics Association and printed in the *Granite State Free Press*, Lebanon, N. H., Feb. 13, 1873.

more, the revenue derived from the sale of heavily wooled, northern Merinos in the South and West declined as the price of coarse wool came to equal, and then to exceed, that of fine wool. Merinos are said to have disappeared from Lebanon by 1890, and the very few farmers who continued to raise sheep turned to the rearing of mutton types.

The quick decline in sheep rearing was accompanied by an equally



FIG. 13—White pine woods in old field in the saddle west of Pinnacle, southeastern Lebanon.

rapid growth of the dairy industry.²¹ During the eight years after 1886 the number of cows was almost doubled, and by 1908 there were more than twice as many cows in Lebanon as there ever had been before this expansion. The creameries took most of the additional milk produced, but domestic buttermaking was not displaced. As early as 1888, however, the butter made at the creamery at West Lebanon alone (66,680 pounds) was more than twice that produced on farms.

The farmer was now confronted with the problem of obtaining the maximum amount of butterfat from his herd. New forage crops, such as ensilage corn and oat hay, were essential. The production of ensilage in Lebanon increased from 350 tons in 1888 to 2870 tons in 1898, and for its storage 25 silos had been added to the equipment of farmsteads. As the limited amount of good tillage land was used to an increasing extent for improved fodder crops that could not economically be brought to Lebanon, grain production dropped rapidly: dependence came to be placed on western grain and stock feeds.²²

²¹ Compare the growth of the dairy industry in Windsor, Vt., in H. F. Wilson: *The Roads of Windsor, Geogr. Rev.*, Vol. 21, 1931, pp. 379-397.

²² In 1913 the outlay for grain (\$1000) on one of the better dairy farms about forty miles north of Lebanon amounted to 43 per cent of all farm expenses (F. E. Robertson and L. G. Dodge: *Some Profitable and Unprofitable Farms in New Hampshire, U. S. Bur. of Plant Industry Circular 128*, 1913, p. 10).



FIG. 14—Upstream from the lower end of the rapids, Lebanon Village. On the left are a shoddy mill, a foundry and machine shop, a split-ball-bearing factory, and a knitting mill. In the foreground on the right is a woolen mill.

Not only did cattle fertilize pastures less thoroughly than sheep, but they also cropped less closely and were not so willing to forage upon woody growth. Consequently more and more trees established themselves in the pastures, and grass was shaded out. The forest steadily encroached on the cleared lands of the town. As early as 1873 it was reported from Lebanon that the area of woodland was increasing. The type of woodland evidently was related to the intensity with which the land was grazed. Two extreme types may be noted, between which there were many variations. On lands where enough stock were pastured to crop back and to prevent the growth of all seedlings except the unpalatable conifers, bushy white pine gained a foothold (Fig. 13). In this manner pure stands of white pine have come to occupy conspicuous portions of the upland where pioneer



FIG. 15—Downstream along the east bank from the lower bridge, Lebanon Village. In the foreground, a woolen mill, beyond it, the "key shop." Power is obtained from turbo-electric generator units of 200 H.P. or less and, in the case of the textile mills, from auxiliary steam plants, which generate heat needed in processing the fabrics.

The deterioration of pasture lands, recognized as early as 1845, continued rapidly. The decline in carrying capacity appears to have been hastened by the change from sheep raising to dairying and by consequent undergrazing—not by overgrazing, as was the case earlier.

settlers found only a few of these trees scattered through a deciduous forest. At the other extreme, on lands either completely abandoned or grazed but little, poplar and gray birch quickly established themselves. Woodland made inroads, too, on some hay lands—along walls, on steep inclines, and

close to large boulders where it proved difficult to mow with a machine. As a result of this varied and persistent encroachment of the forest the general appearance of the countryside has grown more and more to resemble that of the early years of the preceding century.

PRESENT-DAY USE OF LAND: URBAN CONDITIONS

Present-day land use in urban and rural areas alike is a continuation of earlier trends. The rural areas, with a greatly diminished population, present the incongruous combination of modern dairy farms in a setting somewhat like that of 1790. The urban centers, which contain more than 80 per cent of the residents of the town, are more populous than ever before. The village of Lebanon, as the Center has come to be known, remains the chief industrial center and has a population of about 4700. West Lebanon, with about 1300 people, is functionally part of a larger railroad and wholesale distributing center, the nucleus of which lies across the Connecticut in White River Junction, Vermont. East Lebanon, with less than twenty houses, has become rural.

The industrial activities upon which the present importance of Lebanon Village rests are much the same as those established by 1892. The manufacture of textiles ranks first with a predepression employment of about 1200 of the total 1700 industrial workers. Clothing, wood products, brick, and specialized metal goods, however, are of importance. The type of metal-using industry that has been able to survive, not only in Lebanon but also in New England as a whole, is exemplified in the business at the "watch key shop," where from 50 to 200 workers are employed. The production of dustproof watch keys upon which the business was founded in 1876 still continues, but new and more important articles have been added. These include watchmakers' tools and small electrical goods such as motors, generators, phonograph drives, and toy shocking coils. The local supply of skilled labor is of prime importance, for the costs of raw materials and transportation are relatively small. Such compact, valuable articles are in marked contrast with the bulky engines and machinery turned out by the early and unsuccessful metal industries in Lebanon.

The chief manufacturing district remains along the banks of the rapids near the center of the village (Figs. 12, 14, and 15). Below the main factory district are the Mascoma Mill of the American Woolen Company and, farther downstream, a 350-horsepower unit of the Grafton County Electric Light and Power Company, which has another plant of equal capacity still farther downstream and a third with a capacity of 24,000 horsepower at the mouth of the Mascoma.

Away from the power seats, at the northern edge of the plain and on the low intervale beyond, are industries requiring less power or



FIG. 16—View south across Colburn Park, Lebanon Village.

about five million bricks are produced in the six or seven warmer months during which it can be operated.

Beyond the eastern border of the built-up village an excelsior mill was constructed in 1903 at an easily developed power site adjacent to railroad, to hard-surfaced road, and to ample flattish land for storing the short logs used. The establishment of this mill is directly related to the abandonment of farms and the less intensive use of pastures; for poplars, those pioneers on abandoned lands, furnish at least 90 per cent of the 6000 cords of wood consumed annually.

New features of the village landscape are the residential areas, largely peopled by millworkers, on the slope west of the central mill district and on the terrace southeast of it. Inferior residential districts, composed of small, lightly constructed buildings, some of them mere shanties, have sprung up on cheaper lands beyond the limits of the thickly built-up village. The fine old houses built along or close to the turnpikes in the early nineteenth century (Figs. 16 and 17) have



FIG. 17—View west along the northern edge of Colburn Park, Lebanon Village.

greater space. Here are the two clothing factories noted earlier, an electrically driven saw-mill, a bobbin mill, and storage yards for building materials and coal. At an excellent surface deposit of clay near the northern edge of the village is a brickyard where

aided in maintaining on these streets, and on the plain as a whole, residential areas of more restricted character.

RURAL LAND USE

In the rural districts dairying has grown to be the chief, and virtually the only, agricultural inter-



FIG. 18—Haying in large field on alluvial lands, Great Hollow.

est of all farmers except one who still relies on sheep. The industry has undergone only minor changes, and these were largely caused by the closing of the local creameries about twenty-five years ago. The production of market milk rather than cream is now the objective of most dairymen. The change has been accompanied by a preference for cattle that produce the maximum quantity of milk—Holsteins and Ayrshires—and by the rearing of fewer hogs and calves, since there now is little skim milk available for these animals. Also, local outlets for dairy products have become of somewhat greater importance than outside markets. Almost half of the farmers who sell whole milk market it in the villages; the remainder sell either to a coöperative creamery at Bellows Falls, Vt., or to Boston. Cream, chiefly for sale in Arlington, Mass., or butter, entirely for sale in the villages, is still produced by about one-quarter of the farmers, most of whom either combine other work with farming or are relatively isolated.

The remaining improved lands are set in a rising sea of woodland (Pl. III). Some of the woodland is used for pasture; some of it yields saw timber, bobbin stock, firewood, and material for the excelsior mill; but much of it is of little value at pre-



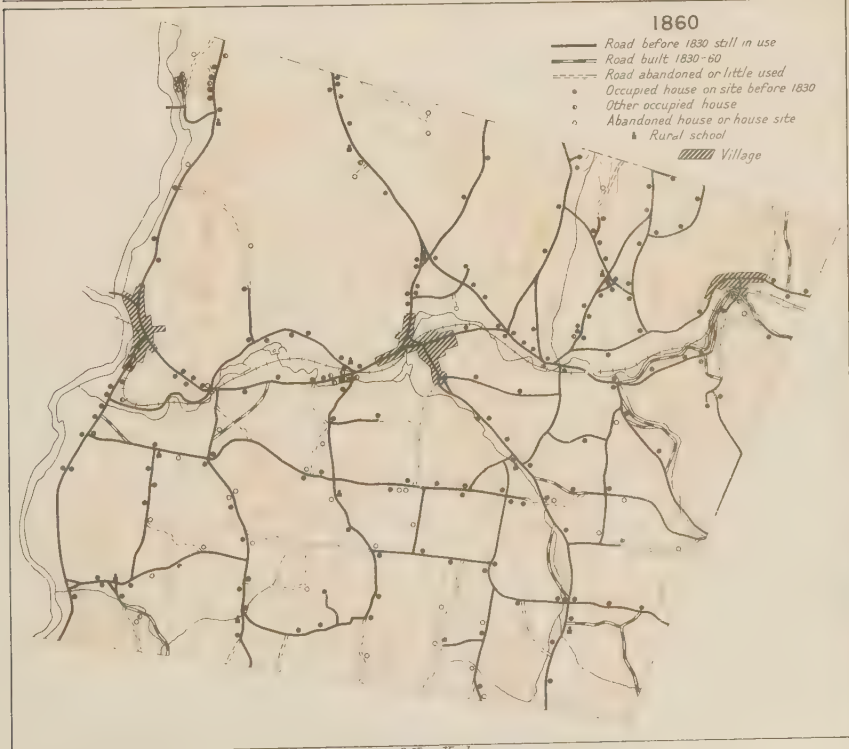
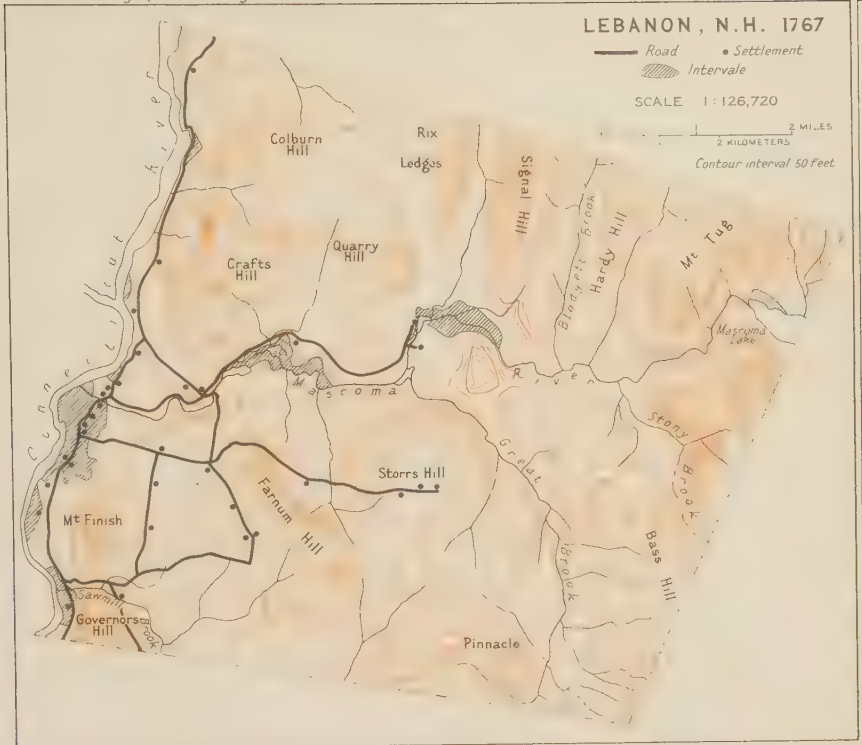
FIG. 19—Tiny hayfield in southwestern Lebanon.

sent. It is chiefly on drier hilltops and on warm, south-facing slopes that grasses have held their ground against the advancing forest. Choked with trees and unnutritious plants such as hardhack, pastures do not yield adequate amounts of summer forage. To supplement scanty pasturage, a few farmers are experimenting with planted pastures of sweet clover, and many more give a small portion of their tilled land to millet or soybeans, which are fed as green fodder during the summer. Large amounts of purchased grain, however, must be fed during both summer and winter. Other forage crops such as ensilage corn and oat hay are grown; but, as has been the case since the beginning of the last century, timothy and clover hay occupies much the greater part of the cultivated land.

As regards their use of the land, the residents of the rural areas may be divided into four groups ranging from full-time farmers to people who do not work the land and are mostly employed in the villages. The widely scattered places at which farming is the only occupation comprise about 30 per cent of the rural residences and include the better farms. The latter are marked by good tillage lands, easy access to hard-surfaced roads, and the expenditure of considerable amounts of labor on the land in the past. The last is of peculiar importance in the uplands; for farm implements can be used efficiently only on extensive tracts that have been cleared of large boulders.

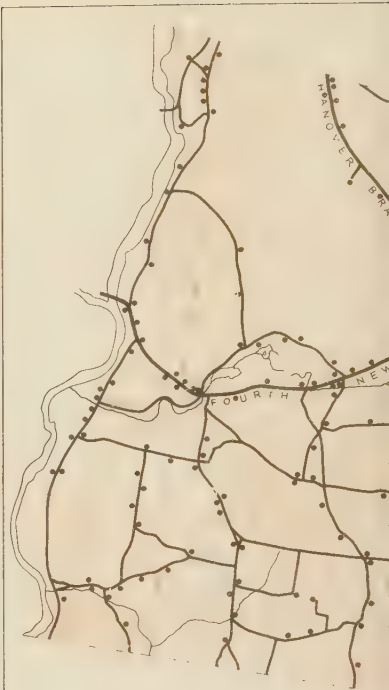
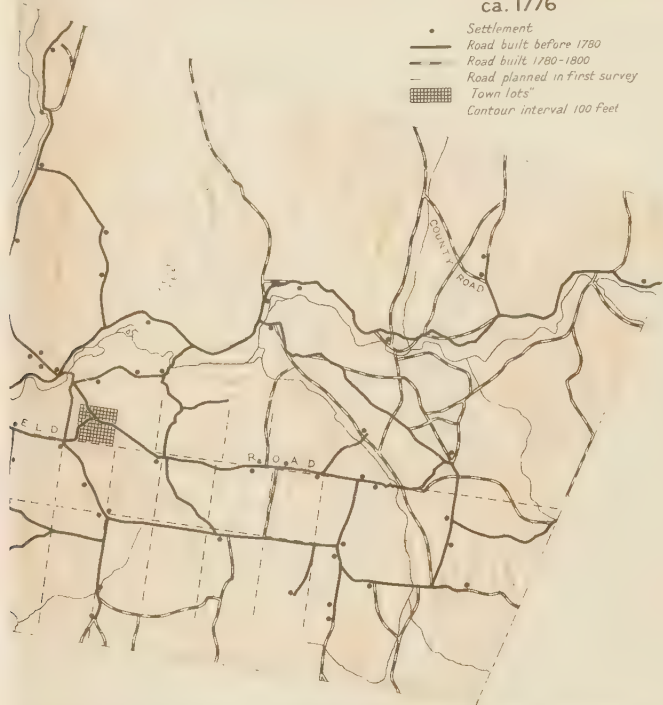
About as many houses are occupied by people who do no farming as by the full-time farmers, but they show a more marked localization along the hard-surfaced and improved roads. The amount of land owned ranges from small patches supporting a shack and a garden to large farms of 200 or more acres. A cow is maintained on some places, but with few exceptions tillage is limited to a garden. With good fortune the owner may be able to rent his pasture land and sell his standing hay. In most cases, however, there is no manure available for hay lands, and without it the crop so deteriorates within a few years that farmers will not trouble to cut and cure the hay if it is given to them, let alone pay for it. Trees come in, and the hayfield is presently obliterated.

Between these two extreme types of rural dwellers are some for whom farming is secondary to regular work in the villages and some for whom farming is the main occupation but who are also more or less regularly engaged in activities not related to the farm. The combination of farming with other occupations is much like that which existed in the early days of subsistence agriculture. In earlier times, however, it was the professional men who combined agriculture and other work; now it is largely the millworkers. The combination of town and country is one of the chief assets of Lebanon. As the young manager of a new industry remarked to the writer, "It is a good place to live."



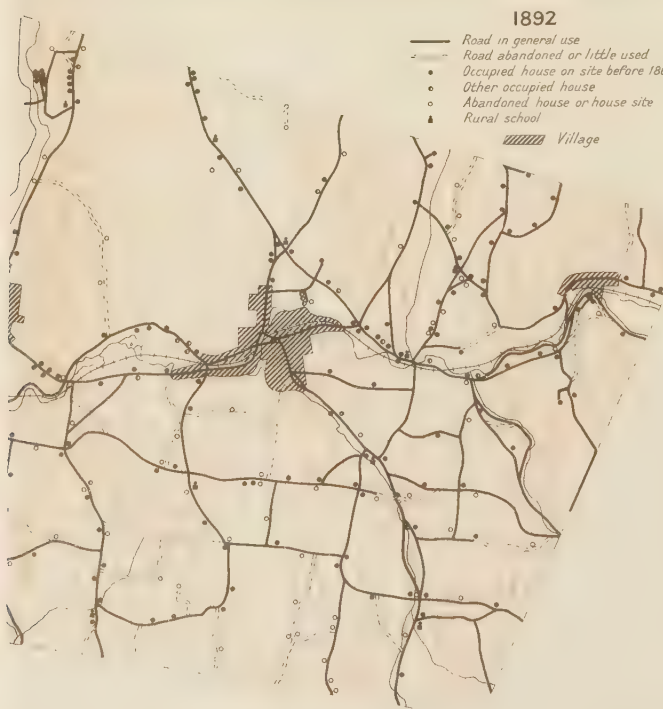
ca. 1776

- Settlement
- Road built before 1780
- - - Road built 1780-1800
- - - Road planned in first survey
- ▨ Town lots
- Contour interval 100 Feet



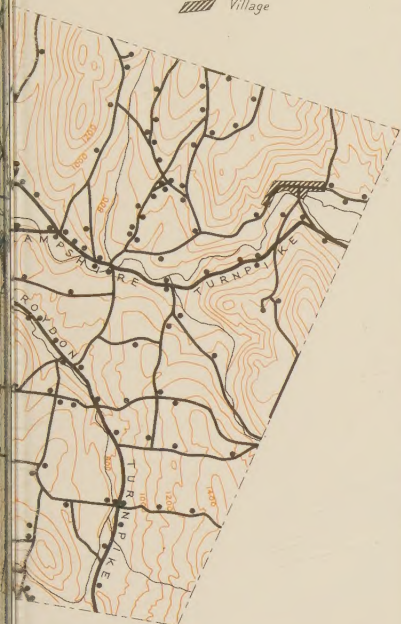
1892

- Road in general use
- - - Road abandoned or little used
- Occupied house on site before 1860
- Other occupied house
- Abandoned house or house site
- ▲ Rural school
- ▨ Village



EARLY NINETEENTH CENTURY

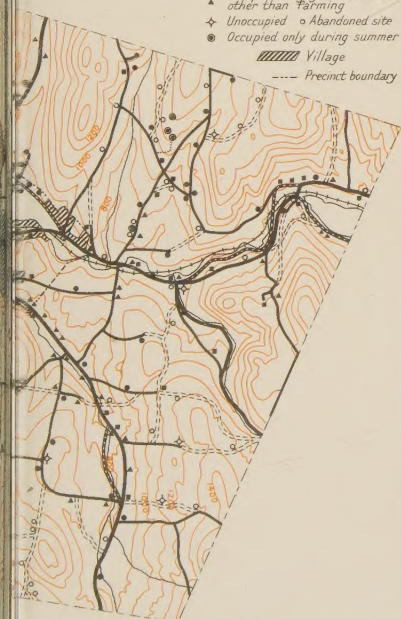
- Turnpike
- Other road
- House
- Village



1930

- Roads
- Improved gravel
- Out of repair
- Abandoned
- Private

- Houses
- Occupant engaged in farming
- Occupant engaged in farming and other activities
- Occupant engaged in activities other than farming
- Unoccupied
- Abandoned site
- Occupied only during summer
- Village
- Precinct boundary



LAND UTILIZATION IN LEBANON, N.H. 1930

- | | | | |
|---|----------------|---|-----------------------------------|
|  | Woodland |  | Orchard |
|  | Wooded pasture |  | Buildings and yards |
|  | Pasture |  | Commonly used roads |
|  | Idle |  | Little used or private roads |
|  | Hay |  | Electric power lines and stations |
|  | Oats |  | Gravel pits |
|  | Corn |  | Railroad |
|  | Other crops |  | Village |

SCALE 1:63360

0 1 MILE
0 1 KILOMETER



